NAVAL HEALTH RESEARCH CENTER

CAREER HISTORY ARCHIVAL MEDICAL AND PERSONNEL SYSTEM (CHAMPS): DATA RESOURCE FOR CANCER, CHRONIC DISEASE, AND OTHER EPIDEMIOLOGICAL RESEARCH

E. K. E. Gunderson
M. R. Miller
C. F. Garland

20040203 027

Report No. 02-06

Career History Archival Medical and Personnel System (CHAMPS):

Data Resource for Cancer, Chronic Disease, and

Other Epidemiological Research

by

E. K. Eric Gunderson, Ph.D.[1]

Milan R. Miller[1]

Cedric F. Garland, Dr.P.H., F.A.C.E[1,2]

[1]Naval Health Research Center, P.O. Box 85122, San Diego CA 92186-5122

[2]Department of Family and Preventive Medicine, University of California, San Diego,

La Jolla CA 92093

Abstract

The Career History Archival Medical and Personnel System (CHAMPS) is a computerized medical and personnel database that provides information on cancer, chronic diseases, occupational and preventive medicine, epidemiological research, and medical management in the Navy. The database was created by researchers at the Naval Health Research Center (NHRC) for Navy enlisted personnel, and currently is being expanded to include all military personnel. CHAMPS organizes data entries, called events, in chronological order by type and date of event and tracks all active-duty service members from date of entry to date of separation. Each event record contains a set of variables that indicates the type and date of the event and the member's status at the time of the event. Event records include medical and personnel data. The Epidemiological Interactive System (EPISYS) provides a desktop interface for rapid automated analysis of the epidemiological data contained in CHAMPS.

Introduction

The Career History Archival Medical and Personnel System (CHAMPS) of the Naval Health Research Center, San Diego CA, is a comprehensive database on personnel and medical information on all members who have served on active duty in the Navy, Marine Corps, Army, Air Force, and Coast Guard (1). For Navy enlisted service members, the database covers the period from 1 January 1965 to the present. The extent of career history to be covered for all other service personnel is shown in Table 1. The process of including data for the populations in Table 1 is in progress.

Personnel data for the Navy and Marine Corps were compiled from Bureau of Naval Personnel and Marine Corps Headquarters files. Medical records for Navy enlisted members were compiled from four electronic files: hospitalization records, medical board findings, physical evaluation board findings, and death records. These files were provided by the Navy Medical Information Management Center (NMIMC), Bethesda, Maryland. All data were edited for accuracy and consistency before entering CHAMPS. All social security numbers (SSNs) were verified, and SSNs that could not be verified were corrected using name and birth date as alternate identifiers. Data elements were kept constant when possible, and all changes in content or coding were documented in a separate electronic documentation file. As new files for the Army, Air Force, and Coast Guard become available, they are being integrated into CHAMPS.

The CHAMPS database combines all component files and data entries, called events, in chronological order by type and date of event, and tracks active-duty members from the date of accession to the date of separation from active service. CHAMPS tracks cross-service changes, such as from Navy to Air Force, and changes from enlisted to officer status. As of 2 January 2002, the CHAMPS database included records of more than six million service members.

Brief History of CHAMPS

Hospitalization records were first obtained by a predecessor laboratory to NHRC from the Naval Medical Data Services Center (now the Naval Medical Information Management Center (NMIMC)) in

the late 1960's. The original purpose was to support studies of mental and psychosomatic disorders. In 1975, the mission of the laboratory was broadened to study all diseases, and the organization became known as Naval Health Research Center (NHRC). NHRC periodically receives medical records from NMIMC that are used to update Navy hospitalization files. The data base currently is being expanded to include all active-duty military personnel, based on records from a number of sources (Table 2).

The CHAMPS database was created by Milan Miller with help from other staff. Miller obtained service history information for Navy enlisted personnel in order to provide denominator data for computing disease incidence rates, and the very large database was moved to the Argonne National Laboratory at the University of Chicago. In recent years, the CHAMPS database has resided at the computer facilities of the Naval Postgraduate School, Monterey CA, CHAMPS has been a major resource for research at NHRC over the past three decades, and many other Navy and university laboratories have used it for epidemiological research. Early research using CHAMPS included a study of Navy enlisted personnel with the sickle-cell trait, glucose-6-dehydrogenase deficiency, and other hematological anomalies. CAPT Charles Brodine and CAPT D. E. Uddin collected blood samples from 8,725 black sailors during the week they entered the Navy. Researchers at Bethesda Naval Hospital analyzed the samples for sickle-cell trait and other anomalies. Anne Hoiberg of NHRC conducted the medical and service history follow-up using CHAMPS and determined that sickle-cell trait did not importantly affect health or performance during four-year enlistments (2). Research conducted at NHRC during the past decade on cancer and AIDS, including human immunodeficiency virus (HIV) infections associated with visits to foreign ports, was facilitated by CHAMPS. The system was a key component of the Navy And Marine Corps HIV Central Registry, a comprehensive tracking system established in the 1980s for HIV testing and documenting the incidence and course of AIDS in the Navy and Marine Corps under the direction of Dr. Frank Garland (3). Data from this collaboration resulted in research published on time trends in HIV infection (4), risk of HIV infection associated with visits to foreign ports (5), and

4

in studies that analyzed immunological data on HIV rapid progressors and provided immunologically-based guidelines for future HIV vaccine development (6,7).

CHAMPS was instrumental in performing occupation health research on Hodgkin's lymphoma (8), testicular cancer (9), non-Hodgkin's lymphoma (10), leukemia (11), and malignant melanoma (12). CHAMPS provided the basis for performance of the largest study to date reporting on incidence of diabetes in young adults (13). The melanoma research led to subsequent identification of ultraviolet A exposure as a major risk factor for melanoma and to recognition of the inability of ultraviolet B sunscreens to prevent the disease (14). This finding has become part of a proposed national campaign for melanoma prevention (15).

CHAMPS was instrumental in performing a collaborative investigation of a cluster of leukemia cases in children at Fallon, Nevada, site of Naval Air Station, Fallon, Nevada. CHAMPS resources were used to identify the history of duty station assignments of parents of children from Navy and Marine Corps families who developed leukemia during recent years (16).

CHAMPS has been used by the Space and Naval Warfare Systems Command (SPAWAR), San Diego, to evaluate the effects of enlistment waivers on performance and early attrition and to track training school assignments. The database has also been used for a study led by Dr. Gerald Larson of NHRC measuring premature attrition rates in Navy enlisted personnel and recently by Gunderson et al. for an assessment of trends in the incidence of infectious diseases in Navy personnel (17).

Gunderson has briefed the Armed Forces Epidemiological Board (AFEB), a panel of experts who advise the Surgeon Generals of the Navy, Army, and Air Force, on the CHAMPS database. Dr. Theodore Woodward, chairman of the AFEB, appointed a special task force of AFEB members and other experts to evaluate CHAMPS as a possible model for a triservice database to support epidemiological research. The task force reported in 1983 that CHAMPS met many requirements for such a triservice role.

Event Records with Data Elements or Variables

CHAMPS career and medical histories contain a series of event records that reflect important changes in status during active-duty military careers. Event records are arranged in chronological order so that a set of records for an individual provides a logical and comprehensive history from the time of enlistment to the time of discharge. Each event record contains a set of variables that reflect the type and date of the event and the member's status at the time of the event. There are two types of event records: personnel and medical.

The first event in CHAMPS histories is the accession event. Variables included in the accession event record are listed in Table 3. The personnel data in the accession event record provide a comprehensive set of descriptors for the incoming recruit. Subsequent records reflect changes in the individual's career as they occur.

Additional event records reflect changes in personnel data are created for changes in pay grade, duty station, name, Social Security Number, and for unauthorized absences, desertion, and discharge. Each record contains the same personnel data variables as the accession record except for a few new variables that are unique to the particular event record. The values for commonly used variables, such as age, pay grade, rate (occupation), duty station, marital status, dependents, and length of service are current for the event date. The most important unique variables for the various event records are :

-Pay Grade: Rate authorization, effective pay date

-Duty Station : Activity (type of ship or duty station), home port, Zip code

-Name and previous names

-Social Security Number (SSN): previous SSNs, verified SSN

-Unauthorized Absence/Desertion: Date, member's activity

-Discharge: Date, DoD loss code (grouped), Original DoD loss code, enlisted designator, secondary
    Naval Enlisted Classification, and Defense Manpower Data Center Separation Code.

The second series of event records pertain to hospitalizations and other medical events. Variables for the hospitalization record are listed in Table 4. Other medical event records, such as those reporting results of medical boards and physical evaluation board, death of the service member, and HIV testing and serological status, have unique variables that apply specifically to that finding or event. Common variables include date and type of event, pay grade, occupation, cause of injury (when applicable), existence of a condition prior to enlistment, duty station, number of days from first event, age, length of service, medical treatment facility, and patient category, if applicable. Data elements that vary over time, such as age, pay grade, and occupation, are obtained from personnel records because demographic and current status data contained in medical records are often inaccurate. Age at event, for example, is computed by subtracting birth date from date of the event. Medical and physical evaluation board records are complete only through 1988.

The Demographic Event Record always appears first in any complete listing of event records because it contains a summary of the individual's entire career and medical history and often can be used to select subpopulations of particular interest for detailed analyses. The variables in the Demographic Event Record are contained in Table 5.

Epidemiological Interactive System (EPISYS)

The Epidemiological Interactive System (EPISYS), created at NHRC, provides an easy-to-use desktop interface with the CHAMPS databases (18). EPISYS is a sophisticated, custom-designed program that currently contains hospitalization, demographic, occupational, and duty assignment records for all Navy enlisted personnel on active duty between January 1980 and December 1999. This program provides rapid access to, and automated analysis of, CHAMPS data. EPISYS uses person-years as denominators and computes first hospitalization (incidence) rates and standardized incidence ratios with confidence limits for any disease and time period by sex, race, age, pay grade, occupation, and type of duty station, including type of ship, or any combination of these. The results are available in a matter of seconds after a data request has been defined. The program also shows admission counts by medical

facility and has a number of other features available such as time series, cluster analysis, and multivariate analysis. The program was written by Dr. Ivan Show and is maintained by Martin White.

Computer, Programming, and Storage Requirements

It is essential that CHAMPS reside on a large, mainframe computer. The volume of data, the very large amount of storage required, and the necessity for high-speed processing dictate that computer capacity must be maximum in terms of current technology. CHAMPS presently resides on computers located at the Naval Postgraduate School, Monterey, California, using the IBM S390 mainframe with the following software systems: Multiple Virtual Storage/ Extended Architecture, Virtual Machine/Extended Architecture, Time Sharing Option, Conversational Monitor System, and SAS. The database can be accessed on terminals at NHRC, and data readily can be edited, corrected, and manipulated. Data sets can be easily extracted for analysis. Data processing is extremely fast (more than one million records per minute). The organization and structure of the database facilitate complex longitudinal studies. Results for large data searches can be made available almost instantaneously. Management of very large databases such as CHAMPS currently is impossible on microcomputers. Attempts to implement databases of similar size on microcomputers have resulted in slow and inefficient data processing. Benchmark studies have shown that because of slow input-output operations, microcomputers require hours to complete data processing that requires only seconds or minutes on a large mainframe computer.

The data processing languages used for CHAMPS on large computers are Common Business Oriented Language (COBOL) and the Statistical Analysis System (SAS). COBOL has been in use for many years and as a major programming language for large-scale business applications and management of large data bases. Some of its applications have been upgraded to keep up with advancing technology. The CHAMPS event structure is unique in providing complete histories of health and performance for all individuals on active duty. This is possible on such a large scale only with a combination of COBOL and SAS for analysis

Database Management: Staffing and Resources

Over the past 30 years, development and management of CHAMPS was funded mainly by principal investigators budgeting relatively small amounts of project resources required for computer costs, data processing and analysis, or similar categories of costs. Because many projects utilized CHAMPS over the years, the cost per project was usually small in relation to the benefits gained. Using the CHAMPS database meant that data acquisition costs were essentially zero, that is, the data were free except for the cost of tapes to transfer data from the source. Data acquisition costs can be very high when investigators must be sent into the field to collect questionnaire, interview, or observational data. This is one reason that investigators prefer to use CHAMPS if appropriate to the particular task. Another consideration is the speed and ease of data processing and analysis.

Certain projects that have major or sole dependence on CHAMPS data, such as the tracking of HIV testing, required much greater resources than projects that are less dependent upon CHAMPS data. Principal investigators who use these resources budget for them as a cost of doing research. Core capability funding and overhead funds are also necessary to maintain continuity and proper management; they also support a central, laboratory-wide capability and service to assist NHRC users and Navy and DoD customers.

CHAMPS requires a team for computer systems management that will constantly support acquisition and management of medical and career data for all active-duty military personnel. Sources for data acquisition currently include the Defense Enrollment Eligibility Reporting System (DEERS), Monterey, CA; the Defense Manpower Data Center, Monterey, CA; the DoD Executive Information/ Decision System (EI/DS), Washington, DC, Standard Inpatient Data Record (SIDR) files; and U.S. Army Medical Research and Materiel Command, Fort Detrick, MD for Standard Ambulatory Data Record (SADR) and other data files. A more complete list of data sources is provided in Table 2. CHAMPS can import foreign databases very easily. Such foreign files are processed through the SSN verification

system. CHAMPS requires a valid SSN, name, date of birth, and date of event. When the data are certified, a unique event code is assigned to the file, and it is merged into CHAMPS.

Demographic, career history, and medical records are organized into a chronological format which facilitates creation of data extracts to be used in prospective longitudinal studies. COBOL and SAS software are used to create extracts for epidemiological studies. The Space and Naval Warfare Systems Command (SPAWAR) has developed a prototype web-based secure front-end that provides selected data lements to approved DoD users.

Performing these functions and operations quickly and efficiently requires a permanent computer systems specialist staff in addition to the CHAMPS manager. In addition to maintenance and management of the CHAMPS database, this team should provide capabilities including: quick response to Navy and Department of Defense inquiries and requests, creation of data extracts for research studies, assistance to authorized users, training for new users, building tables for general use, and other activities that facilitate research planning and execution.

Changes in Reporting of Hospital Admissions

Prior to 1990, BUMED had in place a long-standing requirement that all Navy medical facilities, ashore and afloat, report admissions to the sick list (hospital admissions) to NMIMC, whose responsibility it was to compile complete and accurate medical statistics for use by administrators, medical planners, and budget analysts. NHRC has made use of these files for research on disease and injury trends in Navy and Marine Corps populations, including crews of deployed ships. In 1990 shipboard medical facilities stopped reporting their admissions, resulting in a substantial loss of inpatient morbidity data for a number of subpopulations. The greatest loss of data was for aircraft carriers, which involved non-reporting of admissions from carriers' crews, admissions from air wings aboard the carriers, and from ships' crews accompanying carriers during deployments. Amphibious assault ships also no longer reported admissions beginning in 1990 from ships' crews and Marines carried aboard during deployments.

This loss of data during the 1990s made it impossible to obtain complete hospitalization data for administrative or research purposes; all databases including CHAMPS were affected. Hospitalization data for deployed naval forces were nonexistent (virtually 100% loss of data). The effects of the missing shipboard admissions were greatest during the Persian Gulf War. This was because a large number of Navy and Marine Corps personnel were deployed, and none of the admissions that occurred in the Gulf region to ship or shore facilities there were reported to BUMED during the 1990s. Two Navy mobile field hospitals in Saudi Arabia did not report any admissions during 1990-1992. Lost shipboard and mobile hospital admissions may have affected reported hospitalization rates for Gulf War veterans that were based upon incomplete data. Other published studies of deployed personnel by the Army also utilized incomplete Navy and Marine Corps hospitalization data, mainly due to non-reporting of admissions to medical facilities aboard ships. Career history (personnel) data were not affected by the missing hospital admissions data, and hospitalization data for shore-based personnel were not affected. CHAMPS users should be fully aware of the missing data problem to avoid error.

A second change in reporting procedures that affected hospitalization data, including CHAMPS, was the reporting of Navy and Marine Corps admissions to Army and Air Force hospitals, beginning in the last quarter of fiscal year 1988. This change in reporting occurred with implementation of the Composite Health Care System in October 1988, and resulted in more than 43,000 additional admissions reported for Navy enlisted members during the 1990s. A third change in reporting procedures was the separate reporting of ambulatory cases (mostly surgical cases that did not need hospital aftercare) beginning in October 1996. This change in reporting resulted in a decline of approximately 20% in reported admissions.

Unique Capabilities of CHAMPS in DoD

CHAMPS is a unique DoD resource. It is the only comprehensive database that provides an archival, longitudinal record of career events and hospitalizations from the date that an individual's service begins until the date of separation or retirement (Table 6). Other databases, such as the EI/DS

SIDR database, provide data on hospitalizations but not on career events. Such databases provide source information that is used in CHAMPS, but they lack the denominator information needed to determine rates. Rates are central to epidemiological research and cannot be computed without accurate denominators. CHAMPS provides both numerator and denominator data. It allows calculation of person-time rates for analytical strata that are required in epidemiological research on military populations, including simultaneous stratification for age, sex, race, branch of service, pay grade group, occupation, and duty station. It supports studies that examine the relationship between duration and nature of service and incidence of hospitalized disease, while controlling for age and other demographic characteristics.

CHAMPS is used mainly through data extracts. In addition to this vital role as a source of numerator and denominator extracts for research, CHAMPS supports a narrative format that provides a chronologically arranged history of the individual's entire military career. It is a unique, event-driven system that combines data from numerous sources in the DoD into a single, coherent, chronologically organized record. It uses powerful software that allows rapid quality assurance and editing, integration of new data, and manipulation of the approximately 6 million career histories that it contains. CHAMPS is updated on a quarterly basis to reflect the latest career changes and medical events during an individual's military career.

The design of CHAMPS is analogous to that of a relational database. Like commercial relational databases, its architecture allows any number of records to be incorporated for a particular individual. It operates with a minimum of computing overhead. For this reason, it runs faster than commercial relational databases which at times have large computing overhead burdens. CHAMPS is designed to be maintained by programmers trained in COBOL without specialized knowledge of proprietary database systems. Most scientific analyses require American Standard Code for Information Interchange (ASCII) text files that read into program packages such as SAS or Statistical Package for the Social Sciences (SPSS) to create files for analysis. CHAMPS is an excellent source of such ASCII files, based on

12

existing extraction routines that are modified as needed to accommodate formats specified by researchers. A number of other reports reflect the use of CHAMPS as a major research resource (19-38). More than 200 studies at NHRC and other laboratories have involved CHAMPS since 1968.

The Future of CHAMPS

CHAMPS will make possible systematic epidemiological studies of disease and injury rates in all services. There is a long history of the use of CHAMPS for studies of morbidity, mortality, and performance in the naval service over the past three decades, and many of these past studies involved issues of special concern to line commands, Navy BUMED, and DoD. Of particular value are capabilities for longitudinal studies involving entire naval careers. Notable advantages of CHAMPS over other large data bases include the ease of incorporating other databases for special studies, the possibility of conducting manpower and performance studies as well as health-oriented studies, and the ability to conduct comparative studies across services using a common set of variables.

Problems facing CHAMPS in the future have to do with assuring adequate staffing and resources to make full use of these assets and to provide sufficient assistance and liaison to both Navy BUMED and DoD managers and research investigators to assure its maximum and effective use for improving health care and preventing diseases and injuries.

References

1. Garland FC, Helmkamp JC, Gunderson EKE, Gorham ED, Miller MR, McNally MS, Thompson, MA. A guide to the computerized medical data resources of the Naval Health Research Center. NHRC Report No. 87-13, San Diego, CA, Naval Health Research Center, 1987.

2. Hoiberg A, Ernst J, Uddin DE. Sickle cell trait and glucose-6-phosphate dehydrogenase deficiency. effects on health and military performance in Black Navy enlistees. Archives of Internal Medicine, 1980; 141: 1485-8.

3. Garland FC, Miller MR, McNally MS, Wu Y, Gorham ED, Balazs LL. The U.S. Navy Human Immunodeficiency Virus Central Registry: Data collection and operating procedures. NHRC Report No. 91-8, San Diego, CA, Naval Health Research Center, 1991.

4. Garland FC, Gorham ED, Cunnion SO, Miller MR, Balazs LL. Decline in human Immuno-deficiency virus seropositivity and seroconversion in U.S. Navy personnel: 1986-1989. American Journal of Public Health, 1990, 82 (4):581-584.

5. Garland FC, Garland CF, Gorham ED, Miller MR, Cunnion SO, Balazs LL. Risk of human immunodeficiency virus (HIV) seroconversion in U. S. Navy personnel following visits to foreign ports. NHRC Report. No. 91-10, San Diego, CA, Naval Health Research Center, 1991.

6. Garland FC, Garland CF, Gorham ED, et al. Specific Western blot bands are associated with initial CD4+ lymphocyte counts in human immunodeficiency virus seroconverters. Annals of Epidemiology, 1994, 32-36.

7. Garland FC, Garland VG, Gorham ED, et al. Western blot banding patterns of HIV rapid progressors in the U.S. Navy seropositive cohort: implications for vaccine development. Annals of Epidemiology, 1996, 6:341-347.

8. Garland FC, Gorham ED, Garland CF. Hodgkin's disease in the U.S. Navy. International Journal of Epidemiology, 1987, 16: 367-372.

9. Garland FC, Gorham ED, Garland CF, Ducatman AM. Testicular cancer in US Navy personnel. American Journal of Epidemiology, 1988, 127: 411-14.

10. Garland FC, Gorham ED, Garland CF. Non-Hodgkin's lymphoma in U.S. Naval personnel. Archives of Environmental Health, 1988, 43: 425-9.

11. Garland FC, Shaw E, Gorham ED, Garland CF, et al. Incidence of leukemia in occupations with potential electromagnetic field exposure in U.S. Navy personnel. American Journal of Epidemiology, 1990, 132: 293-303.

12. Garland FGC, White MR, Garland CF, Shaw EK, Gorham ED. Occupational sunlight exposure and melanoma in the U.S. Navy. Archives of Environmental Health, 1990, 45: 261-267.

13. Gorham ED, Garland FC, Barrett-Connor EL, Garland CF, et al. Incidence of insulin-dependent diabetes in young adults: experience of 1,567,630 U.S. Navy enlisted personnel. American Journal of Epidemiology, 1993, 138:984-987.

14. Garland CF, Garland FC, Gorham ED. Rising trends in melanoma: a hypothesis concerning sunscreen effectiveness. Annals of Epidemiology, 1993, 3:104-10.

15. Manson JE, Rexrode KM, Garland FC, Garland CF, Weinstock MA. The case for a comprehensive national campaign to prevent melanoma and associated mortality. Epidemiology, 2000, 11:728-34.

16. Garland CF, Ryan MAK, Gorham ED, Gunderson EKE, Smith T, Miller M, Honner W, Garland FC. Incidence rates of lymphoid leukemia in children of active-duty Navy servicemembers. NHRC Technical Document No.. 01-6F. San Diego, CA: Naval Health Research Center, 2001.

17. Gunderson EK, Hourani, L, Garland C. nfectious disease rates in the U.S. Navy. Military Medicine, 2001, 166: 544-9.

18. Jaeger JA, White MR, Show IT. Epidemiological Interactive System (EPISYS) user's guide, version 1.0. NHRC Technical Document No. 97-1A, San Diego, CA, Naval Health Research Center, 1997.

19. Gorham ED, Garland FC, Helmkamp JC, Gunderson EKE. Disease and injury in U. S. Navy engineering occupations. NHRC Report No. 87-8, San Diego, CA, Naval Health Research Center, 1987.

20. Garland FC, Gorham ED, Garland CF. Non-Hodgkin's lymphomas in U. S. Navy personnel. Archives of Environmental Health, 1988, 43(6):425-9.

21. Garland FC, Mayers DL, Hickey TM, Miller MR, Shaw EK, Gorham ED, Bigbee LR, McNally MM. Incidence of human immunodeficiency virus seroconversion in U. S. Navy and Marine Corps active-duty personnel. 1986 through 1988. Journal of the American Medical Association, 1989, 262(22):3161-5.

22. Garland FC, Gorham ED, Miller MR, Hickey TM, Balazs MS. Cross-sectional demographic characteristics of Human Immumnodeficiency Virus (HIV) seropositive Navy and Marine Corps active duty personnel. NHRC Report No. 90-3, San Diego, CA, Naval Health Research Center 1990.

23. Garland FC, White MW, Garland CF, Shaw EK, Gorham ED. Occupational sunlight exposure and melanoma in the U. S. Navy. Archives of Environmental Health, 1990, 45:261-7.

24. Gorham ED, Garland FC, Mayers DL, Goforth RR, Brodine SK, Weiss PJ, McNallyt MS, and the Navy Retroviral Working Group. T-4 lymphocyte counts and percents within 24 months of Human Immunodeficiency Virus (HIV) Seroconversion in U. S. Navy and Marine Corps Personnel. NHRC Report No. 91-42, San Diego, CA, Naval Health Research Center 1992.

25. Garland FC, Gorham ED, Garland CF, Miller MR, Brodine SK, Balazs LL, and the Navy HIV Working Group. Geographic variation in Human Immunodeficiency Virus seroconversion rates in the U. S. Navy. NHRC Report No. 92-20, San Diego, CA, Naval Health Research Center, 1992.

26. Gorham ED, Garland FC, Mayers DL, Goforth RR, Brodine SK, Weiss PJ, McNally MM, and The Navy Retroviral Working Group. CD4 lymphocyte counts within 24 months of Human Immunodeficiency Virus (HIV) Seroconversion: findings in the U. S. Navy and Marine Corps. Archives of Internal Medicine, 1993, 153:869-76.

27. Garland FC, Garland CF, Gorham ED, Miller MR, Brodine SK, Balazs LL. Geographic Variation in Human Immunodeficiency Virus Seroconversion rates in the U. S. Navy. Journal of Acquired Immunodeficiency Syndrome 1993, 6:1267-74.

28. Gorham ED, Garland FC, Barrett-Connor E, Garland CF, Wingard DL, Pugh W. Incidence of insulin-dependent diabetes mellitus in young adults: experience of 1, 587,630 U. S. Navy enlisted personnel. American Journal of Epidemiology, 1993, 138:1-4.

29. Banta GR, Rahilly D, Garland FC, Gorham ED, Brooks JR. Incidence of heat injury among Navy enlisted personnel (Abstract). Proceedings Aerospace Medical Association, November 1993.

30. Garland FC, Musch DC, Garland CF, Gorham ED, Balazs LL, Doyle EJ, Pugh WM. The descriptive epidemiology of eye injury requiring hospitalization in U. S. Navy enlisted personnel. NHRC Report No. 93-24, San Diego, CA, Naval Health Research Center, 1993.

31. Garland FC, Garland CF, Gorham ED, Brodine SK, Weiss PJ, and the Navy HIV Working Group. Specific Western blot banding patterns are associated with initial CD4+ lymphocyte counts in human immunodeficiency virus seroconverters. Annals of Epidemiology, 1994, 4:32-6.

32. Garland FC, Garland CF, Gorham ED, Brodine SK, and the Navy Retroviral Working Group. Western Blot banding patterns of HIV rapid progressors in the U. S. Navy seropositive cohort: Implications for vaccine development. Annals of Epidemiology, 1996, 6(4):341-7.

33. Garland FC, Garland CF, Doyle EJ, Balasz LL, Levine R, Pugh W, Gorham ED. Carpal tunnel syndrome and occupation in U. S. Navy enlisted personnel. Archives of Environmental Health, 1996, 51(5):395-407.

34. Garland FC, Garland CF, Gorham ED. The association of unplanned pregnancy, marital status, and age with adverse reproductive outcomes and elective abortions in U. S. Navy women. NHRC Report No. 98-7, San Diego, CA, Naval Health Research Center, 1998.

35. Garland FC, Garland CF, Gorham ED. A model of the expected occurrence of adverse pregnancy outcomes during U. S. Navy ship deployments. NHRC Report No. 98-16, San Diego, CA, Naval Health Research Center, 1998.

36. Garland FC, Miller MR, McNally MS, Wu Y, Gorham ED, Balasz LL. The U. S. Navy Human Immunodeficiency Virus (HIV) Central Registry: data collection and operating procedures. NHRC Report No. 91-8, San Diego, CA, Naval Health Research Center, 1991.

37. Gorham ED, Garland CF, Benenson AS, Wingard DL, Garland FC, Conway TL, Macky DW, Gray GC. Upper respiratory infections and environmental conditions in two U. S. Navy shipboard populations. NHRC Report No. 99-16, San Diego, CA, Naval Health Research Center, 1999.

38. Garland CF, Gorham ED. A model of the expected occurrence of adverse pregnancy outcomes aboard U. S. Navy ships. Military Medicine, 2000, 165(9):691-7.

Table 1. Status of Career History Archival Medical and Personnel System (CHAMPS) for All Services

Service Category	Career History Dates	Status
Navy enlisted	October 1, 1965 to present	Complete
Navy officers*	January 1, 1973 to present	In progress
Marine Corps enlisted	January 1, 1976 to present	Complete
Marine Corps officers	January 1, 1976 to present	In progress
Army enlisted	October 1, 1980 to present	In progress
Army officers	October 1, 1980 to present	In progress
Air Force enlisted	October 1, 1980 to present	In progress
Air Force officers	October 1, 1980 to present	In progress
Coast Guard enlisted	January 1, 1989 to present	In progress
Coast Guard officers	January 1, 1989 to present	In progress

*Includes warrant officers.

Table 2. Data Sources for CHAMPS

File	Source
Duty station	Enlisted Master Record
All other events	Enlisted Transaction File
Navy officers	Officer Master Records-1635 and 3600
U.S. Marine Corps – all personnel	Headquarters Marine Corps, Fleet Marine Force File and Transaction File (each has six different formats)
All services	Defense Manpower Data Center binary (1980-89), Mixed (1990-1993), and character files (1994-2001)
All services	Executive Information/Data System – Standard Inpatient Data Record (SIDR)
All services	Composite Health Care System
Navy and Marine Corps	Information Management Center (five different formats)

Table 3. Variables in the Accession Event Record

Variable	Contents
Active-Duty Service Date	Date the individual started active duty
End of Obligated Service Date	Date the individual's term of obligated service will be completed
Event Date	Date of this event
Event Code	Type of event (Accession)
Number of Enlistment	First, second, third, etc. enlistment
Term of Enlistment	Number of years in current enlistment
Reenlistment Code	Code for reenlistment
Regular/Reserve	Current status
Pay Grade	Pay grade at the time of entry, usually E-1
Rate (Occupation) USN Enlisted/Designator	Code for occupation for enlisted personnel
USN Officer/USMC SMOS	Code for occupation for officers
USN Enlisted Rate	Code for occupation for enlisted personnel
USN Officer Designator	USN Officer/SMOS USMC
USMC MOS	Military occupational specialty for Marine Corps Personnel
USN PNEC/Subspecialty/Second MOS	Additional occupation code

Term	Description
USN Primary Enlisted Classification	Additional occupation code
USN Officer Subspecialty	Additional occupation code
USMC Second MOS	Additional occupation code
Accounting Category	Pay category
Term Status	Number of enlistment and insular force or reserve
Sea/Shore Duty	Type of duty assignment at time of event
Duty Station/PAMI/UIC/RUC	Unit Identification Code (UIC) that identifies member's command
Regular/Reserve Branch Class	Branch and component
Education	Years of school completed
Marital Status	Marital status at time of entry
Primary Dependents	Number of dependents at the time of enlistment
Number of Days Since First Event	Elapsed days since first event in career history
Age	Age at event
Length of Service	Years of service
Type Acquisition	Type of enlistment
Branch Class	Current branch and component
Branch Class Discharge	Branch and component from which last discharged
Type Enlistment	Type of enlistment or reenlistment
Military Obligation Designator	Indicates military obligation status

- **Enlistment Designator** — Indicates enlistment status

- **Security Clearance** — Member's security clearance

- **DoD Occupational Group** — Job grouping or classification

Table 4. Variables in the Hospitalization Event Record

Variable	Content
NHRC Diagnosis	Code in a comprehensive diagnostic classification system that encompasses all past and present systems
Date Discharged	Date released from the hospital .
Date Admitted	Date admitted to the hospital
Event Code	There is a separate code, ranging from 601 to 608 and record for each, diagnosis in the order listed in the discharge summary
Hospital Days	Number of days hospitalized during this hospitalization
Job Related	Code indicating whether a condition is considered to be occupationally related
Number of Diagnosis	Number of diagnoses in the record (from 1 to 8)
Type Transaction	Type of release from medical facility (primary diagnosis record only)
Military Theater of Operation	Geographic area where disease or injury occurred (through 1983)
Pay Grade	Pay grade at the time of hospitalization
USN Enlisted Rate/USN Officer or USMC Designator/ Military Occupational Specialty	Member's occupational specialty at the time of hospitalization

23

Cause Code	Cause of current hospitalization, if for an accident,
Medical Holding Company Disposition	Type of release from a Medical Holding Company
Duty Station	Type or location of duty station
Existed Prior to Entry Service	For each diagnosis (record), indicates whether condition existed prior to enlistment
Type of Admission	How patient was received at admitting facility, such as Directly or by transfer from another facility.
MTO CHCS	State and country code
Marital Status	Marital status at time of admission
Primary Dependents	Number of dependents at the time of admission
Number of Days Since First Event	Indicates elapsed days since first event in record
Age	Age at admission
Length of Service	Length of service at admission
Military Treatment Facility	Unit Identification Code (UIC) for admitting medical treatment Facility
Surgical Procedure	Code from the International Classification of Procedures in Medicine, Volume 1, indicating type of surgery or procedure performed
Patient Category	Branch/status of member at the time of first admission
DDDIC/ICDA-8/ICD-9	Diagnosis in specific diagnostic classification system

24

Table 5. Variables in Demographic Event Record

Variable	Contents
Total Number of Events	Number of events for the member during military career (up to 355)
Service Code	Branch of services in which member has served: Navy, Marine Corps, Army, Air Force, Coast Guard, and whether officer, warrant officer, enlisted or combinations.
Duplicate Social Security Number (SSN)	Code to indicate whether there is more than one SSN for this individual
SSN/Service Number	Identifies member (SSN after 6/30/71)
SSN Verify.	Status of member's SSN as maintained by the Social Security Administration
SSN/Name Chance	Indicates name change or an SSN change for the member
Last name, first name, middle name	17 position alphabetic field
Birth Date	Birth date in CCYYMMDD format
Sex	Gender
Race	Five categories of race or unknown
Ethnic Group	Cultural heritage characteristics, if different from general population (self-reported)
Religion (Marine Corps)	Member's religious denomination or reference group

Term	Definition
Marital Status	Member's current marital status
Primary Dependents	Code for whether member has a spouse, and number of children
State Home of Record	Indicates state or U.S. possession in which member was resident at entry
Citizenship	Member's citizenship
Officer Education	Officer's education level from less than high school through Doctoral
Education	Years of school completed
General Classification Test	Test score regarding ability to understand words and their relationships
Armed Forces Qualification Test (AFQT)	For men: AFQT percentile score; for women, selection test score
Mental Group	Classification based on AFQT or GCT score: 5 groups
Success SCREEN Score	Estimated probability that recruit will complete 2 years, based on age, education, test scores, and marital status
Military Obligation Designator	Particular provision of law applicable to member's obligation
Sea/Shore Duty	Indicates if member ever had sea duty
Regular/Reserve Indicator	Indicates if member been in regular or reserve unit or both
Recommend Reenlistment	Indicates whether member has been recommended for reenlistment during career

Term	Definition
Place of Birth	State or country (if non-USA) of birth
Number of Positive HIV Tests	Number of positive HIV Tests
Number of Hospitalizations	Number of hospitalizations
Number of Medical Boards	Number of medical boards
Number of Physical Evaluation Boards	Number of physical evaluation boards
Number of Promotions	Number of promotions
Number of Demotions	Number of demotions
Number of Unauthorized Absences	Number of unauthorized absences
Number of Desertions	Number of desertions
Naval Training Command	Recruit training center to which assigned and whether discharged during recruit training
Recruit Program at Enlistment	Type of program to which assigned at entry
Recruit School Program	Type of school program and occupational specialty member will try to achieve
Attrition Indicator	Indicates whether member completed obligated service
Performance Score	Scale reflecting quality of military performance over member's Career
Total Force Status	Member's current career status – all services

27

Table 6. Comparison of CHAMPS with Other Military Databases

Database	Time Period Covered	Career Events	Duty Station	Hospitalization	Narrative Feature	Archival Feature
CHAMPS for Navy Enlisted	1965-	Yes	Yes	Yes	Yes	Yes
Pending CHAMPS for Navy officers	1973-	Yes	Yes	Yes	Yes	Yes
Pending CHAMPS for Marine Corps officers and enlisted	1976-	Yes	Yes	Yes	Yes	Yes

28

	Year						
Pending total force CHAMPS, Army, Air Force Elements	1980-	Yes	Yes	Yes	Yes	Yes	Yes
Pending Coast Guard CHAMPS	1989-	Yes	Yes	Yes	Yes	Yes	Yes
EI/DS SIDR (DoD)	1990-	No	Yes	Yes	No	No	
DMED (Army-total force)	1990-2002	No	Some	Yes	No		
DMDC (DoD)	1965-	Yes	No	No	No		
NMIMC (Navy and Marines only)	1960-	No	Yes	No	No		

29

REPORT DOCUMENTATION PAGE

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB Control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. Report Date (DD MM YY) 6 MAR 02	2. Report Type Final	3. DATES COVERED (from - to) 1 OCT 2000 – 1 MAR 2002

4. TITLE AND SUBTITLE The Career History Archival Medical and Personnel System (CHAMPS): Data Resource for Cancer, Chronic Disease, and Other Epidemiological Research	5a. Contract Number: 5b. Grant Number: 5c. Program Element: 63706N
6. AUTHORS Gunderson EKE, Garland CF, Miller MR	5d. Project Number: 5e. Task Number: 5f. Work Unit Number: 60204
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Health Research Center P.O. Box 85122 San Diego, CA 92186-5122	9. PERFORMING ORGANIZATION REPORT NUMBER Report 02-06
8. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES) Chief, Bureau of Medicine and Surgery Code M2 2300 E St NW Washington DC 20372-5300	10. Sponsor/Monitor's Acronyms(s) BUMED
	11. Sponsor/Monitor's Report Number(s)

12 DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT (maximum 200 words)

The Career History Archival Medical and Personnel System (CHAMPS) is a computerized medical and personnel database that provides information on cancer, chronic diseases, occupational and preventive medicine, epidemiological research, and medical management in the Navy. The database was created by researchers at Naval Health Research Center (NHRC) for Navy enlisted personnel, and currently is being expanded to include all military personnel.

CHAMPS organizes data entries, called events, in chronological order by type and date of event and tracks all active-duty service members from date of entry to date of separation. Each event record contains a set of variables that indicates the type and date of the event and the member's status at the time of the event. Event records include medical and personnel data. The Epidemiological Interactive System (EPISYS) provides a desktop interface for rapid automated analysis of the epidemiological data contained in CHAMPS.

15. SUBJECT TERMS
Epidemiology, hospitalization data, databases, military populations

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UNCL	18. NUMBER OF PAGES 29	19a. NAME OF RESPONSIBLE PERSON Commanding Officer
a. REPORT UNCL	b.ABSTRACT UNCL	c. THIS PAGE UNCL			19b. TELEPHONE NUMBER (INCLUDING AREA CODE) COMM/DSN: (619) 553-8429

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18